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ABSTRACT

As computer technology becomes more sophisticated and as its application as an instructional tool increases, there is an increasing need to establish a central reservoir of computer resources and to organize a formal exchange procedure for computer hardware and software. Through Project C-BE at the University of Texas at Austin, a bilingual workshop was organized to test the concept of transferability of university-level, computer-based undergraduate teaching packages. Three days were spent in discussions of computer-assisted instruction, computer hardware, the design of instructional packages, and various programing languages. On line demonstrations were used to illustrate the concepts and topics discussed. The appendixes show information about conference attendance, equipment used, technical problems, and participant evaluations. (EMH)

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THE USE OF A BILINGUAL WORKSHOP FOR TRANSFERRING THE CONCEPTS AND TECHNIQUES OF COMPUTER-BASED INSTRUCTION

EP-20/9/10/73

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THE USE OF A BILINGUAL WORKSHOP FOR TRANSFERRING THE CONCEPTS AND TECHNIQUES OF COMPUTER-BASED INSTRUCTION

M. T. Muller, S. J. Castleberry, and G. H. Culp

Introduction

As the use of computer-based education increases, it is becoming apparent that one of the major areas of concern with the use of these techniques lies with the aspect of transferability of materials from site to site and from computer system to computer system. In the ten years that computer-based instruction techniques have been studied, a large amount of curriculum matter in a broad spectrum of disciplines has been developed for use at lower, middle, and upper educational level institutions. Although value in instruction has been demonstrated in several of these studies,[1] the full potential of computer-based education is not being met. The tragedy of the situation is that it is estimated that as much as 90 percent of the computer-based material is not compatible (for one or more reasons) for direct transfer from one educational institution to another. Some causes of non-transfer of computer-based materials are:

1. The lack of common (Federal) technical standards for industry for the design of computers used in educational systems.

2. The lack of standard procedures for formatted educational courseware and related documentation.

3. The lack of a central reservoir or resource center for listing all courseware for public diffusion.

4. The lack of acceptable remunerative processes within educational institutions for author recognition, copyrighting, and royalties for computer courseware.

Despite these drawbacks, much progress has been made through organizations like ENTELEK, ERIC, and other automated or computerized data base projects by listing or storing such course references within their systems. The University of Wisconsin has published an excellent reference of computer assisted programs.[2] In all instances these are library type source materials.

The Program and Literature Service (PALS)[3] also has an extensive listing of computer-related curriculum materials available at the North Carolina Educational Computing Service.

In hopes of providing insight into the solution of the problem associated with the transferability of computer-related curriculum materials, two National Science Foundation sponsored projects have been assigned to include within their goals an in-depth study of the aspects of transferability.

Project C-BE at The University of Texas at Austin, co-directed by Dr. J. J. Allan and J. J. Lagowski, has been initiated to provide for the development of computer-based courses in a wide area of disciplines within the sciences and engineering. Its goals are to:

1. Identify computer-based concepts that are common among several disciplines.

2. Develop evaluation procedures for this type of effort.

3. Identify the elements of transferability.

4. Develop an implementation model.

Project CONDUIT (Computers at Oregon State, North Carolina, Dartmouth, and the Universities of Iowa and Texas at Austin) is a consortium of five regional computer networks organized to study and evaluate the transportability and dissemination of computer-related curriculum materials for use at the undergraduate level of instruction. CONDUIT at The University of Texas at Austin is co-directed by Drs. C. H. Warlick and J. C. Browne.

In an effort to further assess the aspects of transferability, members of these two projects were instrumental in conducting a workshop entitled "Use of the Computer in the Conversational Mode as a Teaching Tool." The workshop was in conjunction with the hemispheric meeting, Sciences and Man in the Americas, held in Mexico City in June, 1972, and sponsored jointly by the American Association for the Advancement of Science and Consejo Nacional de Ciencia y Technologia. The purpose of this paper is to describe the design, scope, and results of that workshop.

General Design of the Workshop

The primary purpose of the workshop was to test the concept of transferability of university-level computer-based undergraduate teaching packages and the pedagogical strategy of their development using remote access terminals.

The packages were developed by Project C-BE. All of the participants were from Latin American countries and had had no prior experience in the use of computer-based instructional techniques. The workshop was conducted in the period of June 17-22, 1973, with 16 participants attending.

The first day of the workshop was devoted to registration of the participants and presentation of an overview of computer-based education. The next three days were utilized in discussion on computer-assisted instruction, computer hardware, the design of instructional packages, and various programming languages. On-line demonstrations illustrating the concepts and topics that were discussed were also used in this period. The final two days of the workshop were devoted to actual program design, development and evaluation by the participants.

Scope of the Workshop

Personnel

The personnel who organized, directed, and conducted the workshop are listed in Appendix A. They are considered as experts in the fields of computer and communication hardware, instructional design, and the development and evaluation of computer-based education.

Of the sixteen workshop participants, nine were university or secondary school professors, four were students, one was a university administrator, one was a research investigator, and one was an educational agency curriculum planner. The participants are listed in Appendix B.

Instructional Materials

A series of bilingual, modular printed materials was developed by Project C-BE. These materials were used by the participants to augment many of the discussions during the 2nd-4th days of the workshops, and included topics of computer applications in education, instructional design, the process of programming, and programming in Extended BASIC. The design of the materials was such that the participants were actively engaged with the materials during the course of discussion. In addition, films were presented on programming and data processing, and several computer programs were accessed on-line to illustrate various strategies in pedagogical design. The materials used are listed in Appendix C.

Computer-Systems Accessed

A total of four separate computer systems and six programming languages were used by the participants:

(1) The CDC-7312 CYBER System located at the Ministry of Telecommunication and Transportation Computer Center in Mexico City was accessed directly to run BASIC and FORTRAN programs transported from the University of Kansas and the University of Texas. The system was also used by the participants to develop FORTRAN and BASIC programs.

(2) The University of Texas at Austin CDC-6600/6400 system was accessed via a long distance telephone line. Programs written in BASIC and CLIC (Conversational Language for Instruction and Computing, developed by the Computation Center of The University of Texas at Austin), and of proved educational merit, were used to demonstrate the capabilities of computer-based education and certain pedagogical strategies that may be incorporated with the program design. All textual output of the programs had been translated to Spanish prior to the workshop.

(3) The PLATO IV system at the University of Illinois at Urbana was accessed by dual long distance telephone lines. It was used to demonstrate computer programs on the system and to illustrate the process of developing programs using the language, TUTOR.

(4) A NOVA 800 system, located at the Maquinas de Informacion in Mexico City, was accessed via direct telephone lines from the workshop site. Extended BASIC programs transported by disk storage from the Project C-BE NOVA 800 system were used as demonstrations on the Mexico City system. In addition, participants used this system to develop programs in Extended BASIC.

A schematic diagram of the available systems, terminals used, and means of communication access is shown in Figure 1.

The Conduct of the Workshop

Approximately three man-months of work were invested in the design and organization of the computer workshop. Development of modular printed materials, coordination of communication requirements, and computer systems and general liaison were handled by Project C-BE with the assistance and cooperation of Dr. Thomas E. Taylor, University of the Americas, Puebla, Mexico, and Dr. Enrique Melrose, Director General, Centro de Investigacion Estadistica y Computacion Electronica, Mexico City, Mexico. Project CONDUIT provided funds to cover the cost of the English-to-Spanish translation for both printed and computer-related curricular materials.

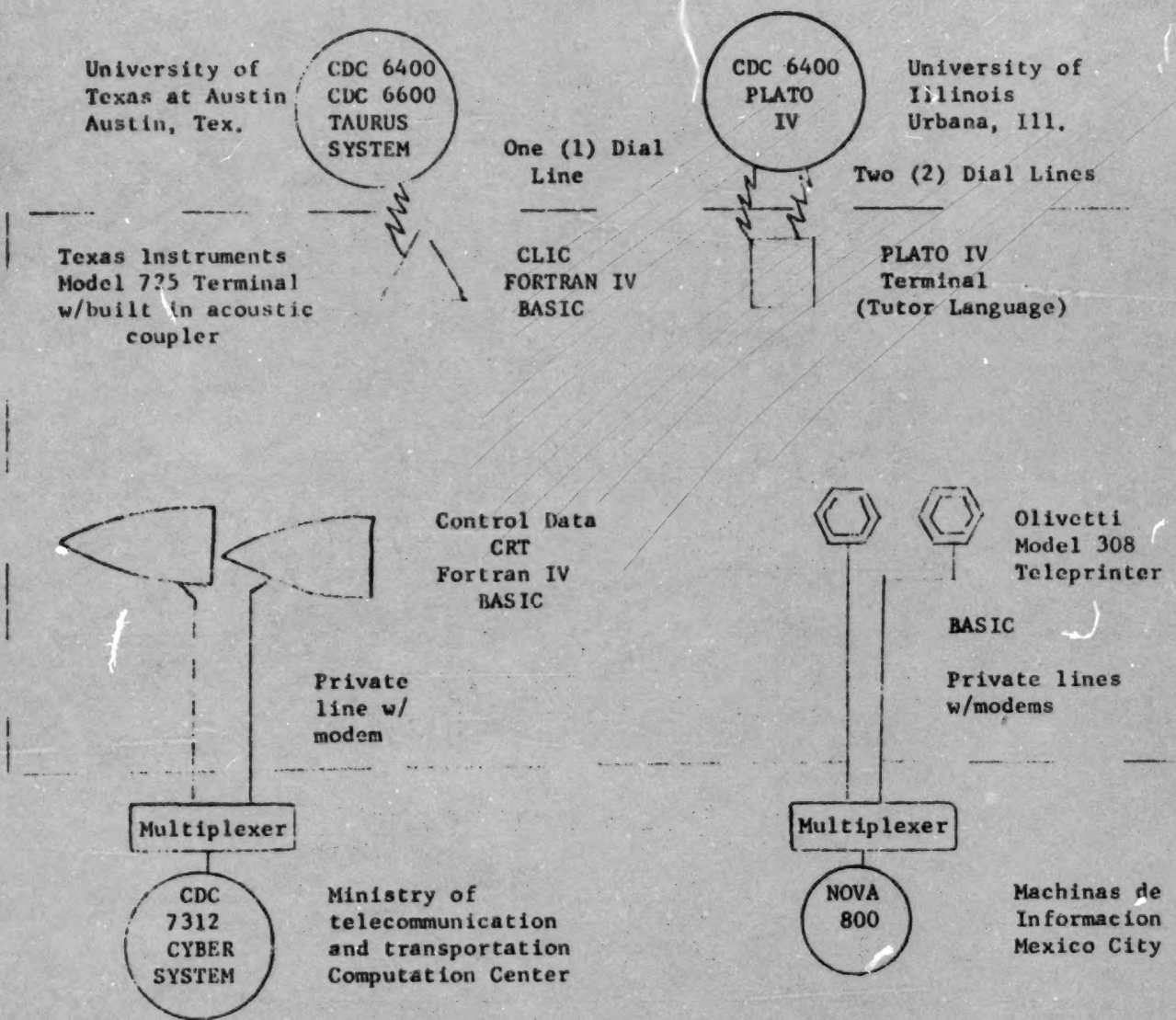

Figure 1. DIAGRAM OF COMPUTER SYSTEMS ACCESSED DURING WORKSHOP

Sequence of Events

A brief outline of the sequence of the workshop follows:

Day	Speaker	Activity/Topic
1	-	Registration
1	Dr. E. Melrose	Opening and Welcome
1	Dr. J. Lagowski	An Overview of Computer-Based Education
2	Mr. Mark Muller	Outline of the Workshop
2	Dr. F. Littrell	Computer-Assisted Instruction
2	Dr. F. Jaimes	Computer Systems
2	Dr. S. Smith	The PLATO IV System
2	-	On-line Demonstration: University of Texas CLIC System
2	-	On-line Demonstration: PLATO IV
3	Dr. G. Culp	Instructional Design
3	-	Film: Programing Is a Process
3	-	On-line Demonstration: University of Texas CLIC Chemistry Lessons
3	Dr. B. Sherwood	An Introduction to TUTOR
4	Dr. S. Castleberry	An Introduction to BASIC
4	Dr. R. Crain	An Introduction to FORTRAN
4	-	On-line Demonstration: University of Texas BASIC System
4	-	On-line Demonstration: CDC-7312 CYBER System, BASIC and FORTRAN
4	-	Film: Data Processing
5		Design of Individual Projects
6	-	Testing & Evaluation of Individual Projects

Most of the verbal presentations were given in English, with either subsequent or concurrent translation into Spanish by interpreters. However, all of the programs used for on-line demonstration from the University of Texas and the University of Kansas were in Spanish, and as pointed out earlier, all of the modular textual materials were available in both Spanish and English versions.

Problems Encountered

Technical Aspects: Hardware and Logistics

The most serious problem encountered was that of coordinating a logistics support, or more specifically the problem of having the right equipment at the right place at the right time for the participants. Particularly difficult was the coordination problem involved in speedily transporting terminals made in the United States through Mexican customs. It took three days to process the permits to free the devices after arrival in Mexico City.

The next most serious problem was that of technical electronic compatibility between European made terminals, European made data sets and U. S. made timesharing computers. It was necessary to interconnect an Olivetti (Italian) terminal with a TELSAT (French) data set to a NOVA 820 (United States) timesharing system. The Olivetti terminals contained different positioning of certain keys and functions. Notably missing was the "escape" key. However, the terminal did use the standard ASCII data transmission code. The interface on the data sets was CCITT standard instead of the E.I.A. RS 232/C standard used in the United States.

Another problem was that of not knowing if the telephone leased lines (private lines) would be operational during the time required. There are two different telephone systems in Mexico City: (a) A Mexican Government owned system, and (b) A commercial common carrier. Communications between the two were sometimes difficult. Severing of operational circuits by the private firm became a common occurrence due to the government agency not precisely setting forth usage dates of lines to the commercial carrier. This situation was rectified midway in the workshop, and smooth operation followed thereafter.

Software

An attempt was made to transfer four different classes of programs:

1. Programs written in standard FORTRAN IV and CACHE[4] specifications on the University of Texas CDC 6600/6400 system.

2. Programs written in Honeywell 635 FORTRAN for the University of Kansas Honewell 635 computer.

3. Programs written in CLIC and translated to University of Texas CDC FORTRAN by a SNOBOL translator on the 6600/6400 system.

4. Programs written in Data General Extended BASIC on the Project C-BE NOVA 820 time sharing system.

An attempt was made to implement the first three classes of programs on the CDC-7312 CYBER system at the Ministry of Telecommunications and Transportation in Mexico City. The fourth class was implemented on the NOVA 800 system at the Maquinas de Informacion in Mexico City.

The first class of programs was implemented with little difficulty. (See Appendix D.) The program was a simulation of a continuously stirred tank developed for a chemical engineering course. The minor changes which had to be made are as follows: Since there were no plotters available, the plot routine was deleted (the program then outputs only tabular data automatically); a program name card to fit the INTERCOM format; replacement of a logical IF statement containing STOP as an argument; a logical IF statement with GO TO ‹variable› as an argument; deletion of calls to TAURUSB (a UT system binary I/O subroutine); and the initialization of a variable in the subroutine CONV. The required to load, edit, and debug the program was two hours.

The second class consisted of three programs (see Appendix C). These programs required considerably more alterations because of differences in FORTRAN, one of the most troublesome being the difference in format for Hollerith data in data statements. It took approximately 40 man hours to load, edit, and debug the programs.

The third class of programs were not successfully implemented due to the fact that they required a special system INPUT/OUTPUT routine which was not present on the CYBER system and would have taken too long to duplicate.

There were other minor problems due to non-standard FORTRAN constraints on logical IF statements and the sequence of declarative and data statements. The minor problems were easily corrected. Approximately 28 man hours were spent on this program, and on the last attempt to compile, the main program compiled with no fatal FORTRAN errors and the required CLIC subroutines compiled with a total of only 6 fatal errors, all of which would be easily correctable.

The ease of transport was in great measure due to the cooperation and help received from the local personnel at the Ministry of Telecommunications and Transportation CYBER installation.

No software problems at all were encountered in transferring the fourth class of programs. The programs were simply copied to a disk pack at the University of Texas, then the pack was hand carried to Mexico City and mounted on the NOVA 800 system. The programs ran without alteration or error.

Method of Evaluation

Each of the participants was asked to complete a five-item questionnaire on the computer workshop. Questions dealing with methods of presentation, future plans of the participants following the workshop, suggestions for future workshops, attitude toward the demonstrated programs, and areas best suited for computer assisted instruction were asked. A sample questionnaire is in Appendix E.

Summary of Results

Following the four days of discussion on a variety of instructional computing concepts, the participants designed, tested, and evaluated individual projects. Three of the participants selected FORTRAN IV on the CDC-7312 CYBER system, three selected BASIC on the NOVA 800 system, and 8 selected TUTOR on the PLATO IV system as a programming language for their project. All of the participants using BASIC or FORTRAN designed, developed, and successfully executed at least one program representative of their discipline. The participants using TUTOR collectively designed and executed one program as a group. The development of this program was carried out by a member of the PLATO IV team.

The results of item one of the questionnaire are shown in Table I. In general, the participants felt that sufficient time was devoted to oral and film presentation and writing programs. However, a majority of the participants indicated that more time should have been allotted to demonstrations and running the program on the terminals. The attitude of the participants toward the time allotted for learning a computer language was fairly evenly distributed but indicated a shift toward a need for more time.

For item two, 11 participants indicated plans to use what they had learned in the workshop in adapting computer techniques to instruction, and 4 indicated some adaptation or realignment of existing systems to incorporate the capability of instructional computing. One questionnaire was not completed for this item.

In item three, the majority expressed a desire for workshops that would provide elaboration on computer systems, terminals, and instructional computing applications. In general, the trend was toward a continuation of the type of workshop presented, with an increase in time allotted for programming.

All participants were unanimous in agreement on item four that the programs that were used as demonstrations would be beneficial in their work in Mexico.

Most participants indicated in item five that instructional computing could be applied to many areas, but those disciplines singled out were mathematics, chemistry, physics, biology, and statistics.

	More Time	About Right	Less Time
A. Oral Presentations	-	15	1
B. Movies	4	12	-
C. Demonstrations	9	5	1
D. Programming Experience			
1. Learning the Computer Language	5	7	3
2. Writing Programs	4	10	1
3. Running Programs on Terminals	14	2	-

Table I

Results of Questionnaire: Item 1

Conclusions and Recommendations

As stated previously, the primary purpose of the workshop was to test the transportation of programs and concepts related to instructional computing. In these aspects, the workshop must be considered a success. Participants learned programming languages. They learned programming strategies applied to pedagogical concepts. This is demonstrated by the actual design and execution of programs related to instructional computing applications within the specific discipline of the participants. The attitude shown by the participants throughout the week of the workshop was one of high interest in and concern for learning of instructional computing applications.

Aspects of the workshop related to hardware must also be considered a success. Four separate computer systems were accessed on numerous occasions with only a minimum number of difficulties being encountered. This success is primarily attributable to the efforts of Mr. Mark Muller of Project C-BE and the cooperation of communication engineers from the Ministry of Telecommunications in Mexico City.

Transportation of computer programs inter-system was partially successful. Programs written in FORTRAN from a Honeywell 635 System at the University of Kansas and from the CDC-6600 System at the University of Texas at Austin were successfully executed on the CDC-7312 CYBER system in Mexico City. One program in BASIC from the University of Texas was also transported to this system. However, approximately 25-40 man-hours were required to get the programs to the point where they were executable. Attempts to get University of Texas CLIC programs running on the CYBER system were unsuccessful, primarily due to incompatibilities in input/output routines.

At the final meeting of the workshop, the leaders of the workshop received an unsolicited formal statement of thanks and appreciation from the participants of the workshop. They, too, felt it had been a success in reaching its primary objectives.

Recommendations

Attendance at the workshop was about 40 percent of what was expected. This low attendance was attributed to a lack of a coordinated effort in widespread publicizing of the workshop. Several attendees at the AAAS/CONACYT meeting appeared midway in the week and stated they had only recently learned of the workshop. A notice for the workshop appeared in a chemical journal after the workshop had concluded. Much advance national publicity in the form of notices in appropriate journals, flyers, and brochures must be devoted to a workshop of this nature.

Although there were no major or permanent failures associated with the workshop, the attempt to plan a large seminar of this type from a remote site did not work at maximum efficiency in an environment where there exist limited access to resources for equipment, data sets and communications. One cannot plan by correspondence alone, and although two members of the United States group were in Mexico City a total of 10 days prior to the workshop, at least 1-2 additional days on-site could have been used effectively.

It is evident as a result of this workshop that interest for innovation in education, including computer-based instruction, has no national distinction. The desire, imagination, interest, enthusiasm, and concern -- all in improving the educational process -- were prominent in the participants' efforts, surpassed only by their open welcome and friendliness. International workshops in the techniques of educational progress should be continued.

Acknowledgments

Many people and agencies were involved with this workshop, and all are due credit for their efforts. This credit should receive special emphasis in that the workshop was of a hemispheric magnitude and was successful. In particular, we wish to acknowledge the Government of Mexico for their cooperation and assistance, Dr. Enrique Melrose, of the Ministry of Telecommunications and Transportation, for his leadership and organization abilities; Dr. Sergio Covarrubias, for providing access to the NOVA 800 computer system; Dr. Thomas Taylor, University of the Americas, Puebla, Mexico, the coordinator of the workshop series; Dr. Carlos De Llano, University of the Americas, for coordinating the translation of the computer programs to Spanish; Ms. Alicia Izarraras, for her expert translation in all aspects of the workshop; the numerous Mexican engineers who set up the various communication systems; Dr. D. M. Himmelblau and Dr. H. E. Nuttall, University of Texas at Austin for the use of the FORTRAN program CSTR; Project C-BE, for providing the demonstration computer programs and funds for developing the modular text materials; Project CONDUIT, for providing funds for translating English text to Spanish; the University of Texas Computation Center for providing computer time and publication support; and the American Association for the Advancement of Science and Consejo Nacional de Ciencia y Tecnologia (through FOMENTE), for providing funds for the long distance line changes and travel costs for the leaders of the workshop.

References

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2. Lekan, Helen A., ed., Index to Computer Assisted Instruction, University of Wisconsin at Milwaukee, 1969, Volume III.

3. Hege, Molly, ed., Program and Literature Service, NCECS, Box 12175, Research Triangle Park, N. C., October, 1972.

4. Standards for Computer Aids in Chemical Engineering Education (CACHE) FORTRAN Computer Programs. National Academy Engineering, 2101 Constitution Ave., NW, Washington, D.C.

Appendix A

Personnel and Description of the Workshop

Workshop I, "Use of the Computer in Conversational Mode as a Teaching Tool"
June 17 - June 22, 1973

Location: Secretaria de Communicaciones y Transportes, Avenida Universidad y Xola, Mexico, D.F., Mexico.

Workshop Director: Dr. Enrique Melrose, Director General, Centro de Investigacion Estadistica y Computacion Electronica, S.C.T., Avenida Universidad y Xola, Mexico, D.F.

Co-arrangers: Dr. Joseph Lagowski, Co-Director, Center for Computer-Based Science Instruction, University of Texas, Austin, Texas, U.S.A.

Col. Mark Muller (retired), Project C-BE, University of Texas, Austin, Texas, U.S.A.

Dr. Sam J. Castleberry, Project C-BE, University of Texas, Austin, Texas, U.S.A.

Dr. George H. Culp, Project CONDUIT, Computation Center, University of Texas, Austin, Texas, U.S.A.

Dr. Bruce Sherwood, Project PLATO, University of Illinois, Urbana, Illinois, U.S.A.

Dr. Carlos De Llano, Chairman, Science and Math, Universidad de las Americas, Apdo. Postal #507, Puebla, Mexico.

Distinguished Professors: Dr. Amancio Pulcherio, Instituto de Pesquisas Espacias, Projecto SACI, Caixa Postal 515, 12.200 Sao Jose dos Campos, SP. Brasil.

Dr. Fred Littrell, 3939 Wake Forest Road, Raleigh, North Carolina, U.S.A.

Dr. Fernando J. Jaimes, ITESM, Sucursal de Correo "J", Monterrey, Nuevo Leon, Mexico.

Dr. Ronald D. Crain, Visiting Lecturer, Department of Chemistry, The University of Kansas, Lawrence, Kansas, U.S.A.

Dr. Stan Smith, Department of Chemistry, University of Illinois, Urbana, Illinois, U.S.A.

Assistants: Alicia Izarraras, Abel Gaspar-Rojas, Jorge Cerda-Reyna.

Description: Minicomputers, as well as complex installations provide a tutor with electronic patience for students who never need to know anything about programming, nor indeed, that computer languages, punched cards, tapes, etc., even exist. Participants will learn to produce and use a variety of programs for teaching different subjects at various levels. On-site terminals and computers, as well as remote connections, will give both teachers and educational administrators experience with several current systems. The workshop is so arranged that both complete novices, as well as those with didactic computer experiences may participate.

Appendix B

Participants in Workshop

"Use of the Computer in Conversational Mode as a Teaching Tool"

Alfonso Diaz Chagollan
Ingeniero Quimico
Universidad Autonoma de Guadalajara

Gerardo J. Hamilton
Analista
Unam-Cempae

Leandro Garza Vargas
Ingeniero
Centro Nacional de Calculo
International Polytechnic Institute, Mexico City

Arturo Valerio Salazar
Ingeniero
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Alejandro Oscos
Psicologo, Profesor
Centro de Investigacion
International Polytechnic Institute, Mexico City

Jesus Ibarra Ribera
Profesor
S. E. P.

Ismael Trejo Bazua
Ingeniero Quimico
Subsecretaria de Majoramiento del Ambiente

Enrique Diaz Ceron
Ingeniero
Direccion General de Educacion Superior
DGES
Mexico City

Jose Antonio Solis Chavez
Ingeniero
Secretaria de Radiodifusion
Mexico City

Vivekananda Kandarpa
Profesor
Universidad de las Americas
Puebla, Mexico

J. Humberto Flores Bustamante
Actuario
Direccion General de Telecommunicaciones

C. University of Kansas (Honeywell 635/FORTRAN)

1. Organic Qualitative Analysis
2. Benzene Chemistry
3. Nomenclature/Formula Writing

Appendix C

Materials Used in the Workshop

I. BOOKLETS[a]

1. Computer Applications in Education
2. Instructional Design
3. Programing is a Process[b]
4. Programming in BASIC, Volume I
5. Programming in BASIC, Volume II

II. FILMS

1. Programing is a Process
2. Data Processing

III. COMPUTER PROGRAMS

A. University of Texas at Austin (Project C-BE)[c]

1. Solution Concentration (CLIC)
2. Nomenclature of Alkanes (CLIC)
3. Organic Synthesis (CLIC)
4. Colligative Properties (CLIC)
5. Equilibrium (CLIC)
6. BASIC Demonstration Program
7. CSTR (FORTRAN)

B. University of Illinois (PLATO)

1. PLATO Demonstration Package
2. Organic Synthesis
3. Population
4. Genetics
5. Acid-base Titration

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[a]All booklets were written in both Spanish and English and are available from Project C-BE.

[b]This booklet was distributed by permission of the copyright holder for use with the film Programing is a Process, Copyright 1967, by the University of Illinois.

[c]All programs used Spanish text.

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DIRECTORS:
Dr. John J. Allan III
Dr. J. J. Lagowski

Appendix D

July 2, 1973

MEMORANDUM

TO: Eric J. Nuttall
Chemical Engineering

FROM: Mark T. Muller
Sam J. Castleberry

SUBJECT: Transferability Experiment Chemical Engineering CSTR Program

Reference: AAAS/CONACYT Symposium (Workshop W-1) held in Mexico City, D.F. (in the Telecommunications and Transportation Building) on June 17-23, 1973. See detailed description of program attached as Appendix 1.

Per your request, the following is an accurate description of the transferability experiment on the CSTR simulation model:

The CSTR simulation was developed to run on the U. T. CDC-6600 TSS (Taurus). Copies of a card deck of the CSTR program, plus a program listing, as well as student instructional handouts, were hand carried from Austin to Mexico City on the 15th of June, and were loaded on a Control Data Corporation Model 7312 CYBER time-sharing system owned by the Ministry of Telecommunications and Transportation. The purpose of the experiment was to test the transferability of common language (FORTRAN IV) using as a medium this model from one system to another.

The program "CSTR" ran successfully on the CDC CYBER 72. We utilized the interactive system INTERCOM supplied by CDC with their hardware and CRT terminals manufactured by CDC. Since there were no plotters available, we deleted the plot routines. There were just a few other minor changes we had to make, and these are noted on the listing given to you. The changes required were a program name card to fit the INTERCOM format, deletion of plot calls, replacement of: a logical IF statement containing stop, a logical IF with a go to; deletion of calls to TAURUSB; and the insertion of the statement NC = 2 after X = XT in subroutine CONV.

The program ran and produced output identical to the sample output from our CDC-6600 system. The instructions and program documentation made the program exceptionally easy to understand and run. The only point of difficulty was determining the necessity (and the correct method) for altering the subroutine CONV.

After the program was debugged, (approximately 2 hours required) several of the participants in our workshop ran the program with ease and apparent understanding. It is estimated that at least 40 persons observed the CSTR simulation module at one time or another during the workshop.

MTM/SJC: kw

Appendix E

Sample Questionnaire

QUESTIONNAIRE - WORKSHOP NO. 1
COMPUTER ASSISTED INSTRUCTION

1. Several methods of presentation were used in this workshop. Circle the number representing your opinion about the amount of time spent for each method.

	MORE TIME	ABOUT RIGHT	LESS TIME
A. Oral Presentations	1	2	3
B. Movies	1	2	3
C. Demonstrations	1	2	3
D. Programming Experience:			
(1) Learning the computer language	1	2	3
(2) Writing programs	1	2	3
(3) Running programs on terminals.	1	2	3

2. What are your plans for using what you have learned in this workshop?

3. What kinds of workshops do you feel would be beneficial in the future?

4. Do you feel that the computer assisted instructional programs you have seen demonstrated in this workshop would be beneficial in your work here in Mexico?

5. In what subjects do you feel computer assisted instructional matter is required?

Your position:
(Circle one)

Administrator

Teacher/Professor

Student

Other: Specify _____